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ABSTRACT

This bulletin is one in a series of environmental education activity guides for grades K-12, developed and field-tested by teachers in the Montgomery County (Maryland) Public Schools. Primarily for use in the middle grades four through six, the guides are not intended to constitute complete units in themselves. They are, rather, a compilation of activities considered appropriate for particular environmental studies. In this guide about streams, for grades five and six, are activities entitled: Measuring Rate of Stream Flow, Measuring Stream Width, Measuring Stream Depth, Measuring Stream Volume, Calculating the Capacity of a Stream to Support Human Life, Measuring Stream Temperature, Measuring the pH, Constructing Collection Nets, Collecting Specimens, and Identifying Specimens. Each activity indicates the instructional objective, procedures to follow, and materials required. Teacher notes are added when necessary. A student evaluation sheet concludes the bulletin. Related documents in the series are SE 015 886 through SE 015 893. (BL)

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Activities for Studying

Streams

Environmental Education Series · Bulletin No. 247-A

MONTGOMERY COUNTY PUBLIC SCHOOLS · ROCKVILLE, MARYLAND · Homer O. Elsenood · Superintendent of Schools

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ENVIRONMENTAL EDUCATION SERIES
ACTIVITIES FOR STUDYING STREAMS
GRADE LEVEL 5 – 6

Bulletin No. 247-A

Montgomery County Public Schools
Rockville, Maryland
Homer O. Elseroad
Superintendent of Schools

INTRODUCTION

For some time, there has been a need for curriculum materials to assist teachers who wish to move the teaching/learning experience beyond the school walls. Although individual schools have prepared materials useful to their own unique purposes, such information and teaching aids have not generally been shared with other schools.

This series of bulletins on Environmental Education was developed after arrangements were made in Area 11 for approximately a dozen 12-month teachers to produce outdoor education materials during the summer of 1969. Field testing of these materials occurred, primarily in Area 11, during the 1969-70 school year.

In the summer of 1970, an Outdoor Education Curriculum Development Workshop was conducted at Randolph Junior High School, during which twelve teachers developed additional materials and reviewed and tested those prepared earlier.

The bulletins in this Environmental Education series are not intended to constitute complete units in themselves. They are, rather, a compilation of activities considered appropriate for particular environmental studies. Whether the series should be used separately or as a supplement to other aids should be determined by the needs and purposes of each teacher and his students.

A word of explanation about format: Each activity suggested has its own stated instructional objective. The achievement of that objective will be an individual experience for each student, even though in some cases the procedures suggested may be group- rather than individually-directed.

PURPOSE

Using data collected in the following activities, the student should be able to describe some characteristics of a given section of a stream. He will begin by observing physical conditions such as temperature, depth, and width. After collecting specimens, both plant and animal, the student will be able to describe the types of life present in the section of the stream.

Students, in groups, may observe different areas of the same stream; they may then discuss the similarities and differences. It may also be worthwhile to have the students make a prediction of possible life forms, after having gathered data concerning physical conditions. These predictions may then be compared with specimens actually found.

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Activity 1: Measuring Rate of Stream Flow

Instructional Objective:

The student will be able to **measure** *how fast the stream is flowing.*

Procedures:

1. Divide students into two or more groups. Have one group observe a section of faster moving water; others, a section of slower moving water. (Students should remain in these groups for all activities listed.)

2. Measure and mark with stakes a 100 ft. distance along a straight section of the stream. (Use this same 100 ft. section in the following activities.)

3. Throw a small stick (2-3 inches long) in the water above the up-stream marker. As the stick passes the first marker, begin recording the number of seconds it takes until it passes the second marker.

4. After taking this measurement three times, determine the average number of seconds.

5. Divide 100 ft. by the average number of seconds. This will tell how far the stick floated each second.

6. Record the results in feet-per-second.

Materials:

100 ft. tape measure
2 stakes
stopwatch
small stick (2-3 inches long)

Activity 2: Measuring Stream Width

Instructional Objective:

The student will be able to take measurements to compute the average width of a section of a stream.

Procedures:

The student will –

1. Measure the width of a stream at three places along the 100 ft. section from bank to bank and record these measurements.

2. Find the average width of the stream and record the average width.

Materials:

100 ft. tape measure

Note:

Students should be cautioned to wear appropriate footwear if they wade. Stress safety precautions.

Activity 3: Measuring Stream Depth

Instructional Objective:

The student will be able to take measurements to compute the average depth of a given section of a stream.

Procedures:

The students will –

1. Wade across the stream in a straight line, stretching the tape or a string in a straight line across the stream to help in measuring.

2. Measure the depth at three places along this line with a yard stick. Record these figures.

3. Find and record the average depth of the stream.

Materials:

100 ft. tape
yardsticks

Note:

The calculations may be done back in classroom.

Activity 4: Measuring Stream Volume

Instructional Objective:

The student will be able to compute the cubic feet of water flowing every second past a given point in the stream.

Procedures:

The student will–

1. Multiply the average depth by the average width by the number of feet per second. This result will be the number of cubic feet of water flowing past a given point every second.

Activity 5: Calculating the Capacity of a Stream to Support Human Life

Instructional Objective:

*The student will be able to calculate the number of people who could live from the amount of water found in a given stream.**

Procedures:

The student will make computations to arrive at answers to the following questions:

1. How many gallons of water flow in this stream every second?

_____	x	_____	=	_____
Stream flow in cubic feet per second		Gallons in one cubic foot of water		Gallons of water per second

2. How many gallons of water flow in this stream every minute?

_____	x	_____	=	_____
Gallons per second		Seconds in minutes		Gallons of water per minute

3. Each person uses about 150 gallons of water a day. What is the total number of people this amount of water would support?

_____	x	1440	=	_____	÷
Gallons of water per minute		Number of minutes in a day		Total gallons of water per day	

_____	=	_____
Amount of water person uses per day		Total number of people who could live from the amount of water found in this stream.

***Note:**

A water flow of 1 cubic foot per second = 448.83 gallons per minute.
1 cubic foot of water = 7.48 gallons.

Activity 6: Measuring Stream Temperature

Instructional Objective:

The student will be able to measure and record the water temperature in a section of a stream.

Procedures:

The student will–

1. Take the water temperature with the bulb of the thermometer at the surface of the water for one minute.

2. Take the water temperature every six inches from the surface to the bottom, using the outdoor part of an indoor-outdoor education thermometer.

3. Find the average temperature of the water and record it.

Materials:

yardstick
thermometer (indoor-outdoor)

Note:

Using the data collected and the following information, the student would describe what type of life may be present.

Temperature	Life Found
Greater than 60° F	Much plant life, catfish
Less than 65° F	Caddis flies, water beetles, striders, stoneflies, may flies, crayfish

Activity 7: Measuring the pH

Instructional Objective:

The student will be able to measure and record the acidity or alkalinity of the water.

Procedures:

The student will–

1. Dip a pH indicator tape into the water.
2. Compare the color change with the chart on the tape box.
3. Record results.

Materials:

pH indicator tape (available from drug stores or high schools)

Note:

The *pH* number is a shorthand way of indicating the hydrogen ion concentration in the water. The larger the pH number, the more alkaline the water; the smaller the number, the more acid the water. An arbitrary scale ranges from 1.0 to 14.0. Point out that the pH of the water has an effect on the life the stream can sustain.

pH Ranges that Support Aquatic Life

Most Acid	Neutral	Most Alkaline
1	7	14

6.5-7.5
Largest variety of animals. Trout, mayfly, stonefly, caddis fly

7.0----------9.0
Snails, Clams

6.5----------9.0
Bass, Crappie

6.0----------12.0
Plants (algae, rooted)

1.0----------Bacteria----------13.0

Activity 8: Constructing Collection Nets

Instructional Objective:

The student will be able to construct a dip net and a plankton tow net.

Several types of nets may be used to collect small water forms. It is well to have two nets that can be fastened to the same handle: one of fine weave for collecting small organisms that may be floating in the water, and one of coarse weave for trapping larger life forms. Nets should have a heavy wire frame about 6-8 inches in diameter. For ease in handling, the handle should be about 3 feet long. A plankton tow net is very easy to use and simple to construct if a commercial one can't be bought.

Procedures:

1. To construct a plankton tow, sew a woman's nylon stocking to a 6-inch diameter ring made from a coat hanger wire.

2. Remove the foot end of the stocking.

3. Attach (with a string) a small plastic vial. A pill container will do nicely.

4. Attach three pieces of string to the ring and to one end of a swivel.

5. To the other end, attach a nylon cord about 30 feet long for towing.

Materials:

nylon cord, 30 feet
swivel (available where fishing equipment is sold)
three thin wires, 8 inches long
six-inch ring of coat hanger
stocking
plastic vial (pill container)

Note:

A tow net is efficient because, as it is pulled in the stream, water passes out through the net while particles accumulate at the end.

Activity 9: Collecting Specimens

Instructional Objective:

The student will collect animal and plant specimens.

Note:

Use the same 100 ft. sections of a stream marked off in previous investigations. Divide the class in half. One-half will collect from a riffle section (an area where the water passes over protrusions in the stream and creates a rapids effect) and the other from a calmer pool section.

Procedures:

1. Toss the tow net out, allow it to sink just below surface, and pull it steadily toward the bank. This can be repeated several times. Then pour the sample into a collection jar, for identification later in classroom.

2. Collect in large, clear jars some of the water from surface, middle, and bottom of the stream. Some of the mud from the bottom should also be collected. Each jar should be clearly labeled as to the site where it was collected.

3. Lift up rocks, and collect any life present. One student should stand upstream from the rock, another downstream two or three feet from it. While one is lifting, the other is waiting with a net in the water to capture any organisms that are under the rock.

Note:

When plants are collected from the bank, bottom, etc., avoid packing too many in one container. Larger plants may be transported in wet newspaper or plastic bags. Large specimens should be returned to stream. Only *one of each type* should be taken from stream during collecting. Students should be permitted to take specimens from any area *only* for specific purposes and should be cautioned against destroying the ecology of even a small area. Whenever possible, specimens should be returned to the natural setting after study.

Activity 10: Identifying Specimens

Instructional Objective:

The student will identify in the classroom the specimens collected from the stream.

Procedures:

1. After mud has settled, some specimens may be seen in the jar through a hand lens.

2. Samples from the different parts of the stream should be observed under binocular microscope or microprojector.

3. Microorganisms congregate at different levels in the water. For examination of life forms, place a cover slip on the bottom of each of the containers, and float one on the top. Leave overnight. Many microorganisms will cling to the coverslips. Carefully remove the coverslips with forceps, and put each of them on a drop of water on a microscope slide.

4. Students may carefully scrape the surfaces of submerged leaves collected. Scrapings can then be observed under the microscope.

5. Large specimens may be transferred to large white, shallow pans for observation.

6. Using the following recommended references, the student should try to identify the specimens:

   Havsman, Leon. *Beginner's Guide to Fresh-Water Life.* New York: G.P. Putnam, 1950.
   Morgan, Ann Haven. *Field Book of Ponds and Streams.* New York: G.P. Putnam, 1930.
   Reid, George K. *Pond Life.* New York: Golden Press, 1967.
   Golden Nature Guide. New York: Golden Press, 1967.
   Non-Flowering Plants. New York: Golden Press, 1967.

Materials:

collecting nets
plankton tow net
large clear jars with lids
labels for jars or marking pencils
plastic bags or newspaper
hand lens
microscopes
microscope slides
forceps
cover slips
white, shallow pans
identification guides

STUDENT EVALUATION SHEET

Student's Name_____

	Observed	Not Observed
1. Measures rate of stream flow	_____	_____
2. Measures stream width	_____	_____
3. Measures stream depth	_____	_____
4. Measures stream volume	_____	_____
5. Calculates the capacity of a stream to support human life	_____	_____
6. Measures stream temperature	_____	_____
7. Measures the pH	_____	_____
8. Constructs collection nets	_____	_____
9. Collects specimens	_____	_____
10. Identifies specimens	_____	_____